

**SYNTHESIS OF 1,2,3,4-TETRAHYDROXYBENZENES AND 1,2,3-
TRIHYDROXYBENZENES USING MYO-INOSITOL-1-PHOSPHATE SYNTHASE
AND MYO-INOSITOL 2-DEHYDROGENASE**

RELATED APPLICATIONS

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5 The present invention is a continuation-in-part of U.S. Serial No. 09/274,732, filed March 23, 1999, *now abandoned*, which is hereby expressly incorporated by reference.

SPONSORSHIP

10 Work on this invention was sponsored in part by the National Science Foundation Grant No. CHE963368. The Government may have certain rights in the invention.

FIELD OF THE INVENTION

The present invention is related to the production of 1,2,3,4-tetrahydroxybenzene and more specifically, to methods of producing 1,2,3,4-tetrahydroxybenzene from the bioconversion of a carbon source.

BACKGROUND OF THE INVENTION

15 Polyhydroxy benzenes and quinones possessing the oxygenation pattern of 1,2,3,4-tetrahydroxybenzene 1 (Figure 1) often display biological activity. Aurantiogliocladin 2 and fumigatin 3 (Figure 1) are antibiotics. Vischer, E.B., *J. Chem. Soc.* 815 (1953); Baker, W. et al., *J. Chem. Soc.* 820 (1953); Baker, W. et al., *J. Chem. Soc.* 670 (1941). Coenzyme Q_{n=10} 4 (Figure 1) is an essential
20 antioxidant in humans protecting low density lipoproteins from atherosclerosis-related oxidative modification. Ingold, K.U. et al., *PNAS (USA)* 90:45 (1993); Stocker, R. et al., *PNAS (USA)* 88:1646 (1991); Steinberg, D., *Circulation* 84:1420 (1991). Dillapiole 5 (Figure 1) is a pyrethrin synergist and is responsible for the
25 sedative effect of *Perilla frutescens* leaves. Honda, G. et al., *Chem. Pharm. Bull.* 36:3153 (1988); Tomar, S.S. et al., *Agric. Biol. Chem.* 50:2115 (1986).

The current method of preparing 1,2,3,4-tetrahydroxybenzene uses pyrogallol as the synthetic starting material. Pyrogallol is converted to aminopyrogallol using a four-step synthesis. Aminopyrogallol is then hydrolyzed to
30 give 1,2,3,4-tetrahydroxybenzene. Conversion of pyrogallol to 1,2,3,4-tetrahydroxybenzene requires the use of such reagents as phosgene, solvents such as pyridine and xylene, and has a nitroaromatic as a synthetic intermediate.

It would also be desirable to provide an improved method for producing derivatives of 1,2,3,4-tetrahydroxybenzene. Particularly, it would be desirable to